Remarks

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and the following remarks. Claims 1-4, 35-41, 44, and 46-53 are pending in the application. Claims 1, 40, and 51 are independent. Claims 1, 40, and 51 have been amended.

Cited Art

The Examiner cites:

Eid et al., U.S. Patent Publication No. 2004/0190771 (hereinafter "Eid");

Denk et al., U.S. Patent Publication No. 2001/0025292 (hereinafter "Denk");

M68000 8-/16-/32-Bit Microprocessors: Programmer's Reference Manual, 1986, fifth edition, page B-35, ISBN: 0-13-541491-1, Publisher: Prentice-Hall (hereinafter "Motorola");

Lundberg et al., U.S. Patent Publication No. 2004/0183949 (hereinafter "Lundberg");

FOURCC.org - YUV Formats, http://www.fourcc.org/yuv.php, pages 1-15 (hereinafter "FOURCC.org"); and

Reitmeier et al., U.S. Patent Publication No. 2003/0202589 (hereinafter "Reitmeier").

Patentability of Claims 1-4, 35-41, 44, and 46-53 Under 35 USC § 103(a)

The Examiner states in the Office action summary that "Claim(s) 1-4, 35-41, 44, and 46-53 is/are rejected." (Action, page 1.) The Examiner additionally comments on claims 46-53 in the Office action on pages 9 and 10. Applicants note, however, that the Examiner only specifies that "Claims 1-3, 5, 35, 39-41 and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over [Eid] in view of [Denk], and further in view of [Motorola]." (Action, page 5.) The Examiner does not explicitly cite the reference or combination of references applied to claims 47-53. Applicants assume that claims 47-53 are rejected over Eid in view of Denk and Motorola, and will respond under that assumption, but respectfully request that the Examiner cure this discrepancy on the record.

The Examiner rejects claim 4 under 35 U.S.C § 103(a) as unpatentable over Eid, Denk and Motorola and further in view of Lundberg.

The Examiner rejects claims 38 and 44 under 35 U.S.C § 103(a) as unpatentable over Eid, Denk and Motorola and further in view of FOURCC.org.

The Examiner rejects claims 36-37 under 35 U.S.C § 103(a) as unpatentable over Eid, Denk and Motorola and further in view of Reitmeier.

All rejections are traversed.

Shifting

The Examiner states in the rejection of claim 1 that Eid discloses "converting (shifted) the n-bit representation (16 bit integer) to a lower-precision representation (10 bit value) by assigning zero values to one or more least significant bits in the fractional component [(0023); **shifting corresponds to assigning zero values**] . . ." (Action, page 6.) Applicants respectfully disagree and believe that a description of shifting will help further a shared understanding of the Eid reference as would be understood by a person of ordinary skill in the art.

Applicants have attached Bitwise operation, http://en.wikipedia.org/w/index.php?title= Bitwise_operation&oldid=178511340 (last visited Jan. 2, 2008) ("Wikipedia",) which describes shifting as an ordinarily skilled artesian would understand the term. Applicants specifically note section 2, which states "In [a bit shift], the digits are moved, or *shifted*, to the left or right." (Wikipedia, section 2, emphasis in original.) Wikipedia continues, "In an *arithmetic shift*, the bits that are shifted out of either end are discarded. In a left arithmetic shift, zeros are shifted in on the right; in a right arithmetic shift, the sign bit is shifted in on the left, thus preserving the sign of the operand." (Wikipedia, section 2.1, emphasis in original.) Wikipedia then gives three examples, specifically:

```
    00010111 LEFT-SHIFT
=   00101110

    00010111 RIGHT-SHIFT
=   00001011
```

[and]

```
    00010111 LEFT-SHIFT-BY-TWO
=   01011100
```

(*Id.*)

Wikipedia additionally states, "the left and right shift operators are '<<' and '>>,' respectively. The number of places to shift is given as the second argument to the shift operators. For example, 'x = y << 2;' assigns *x* the result of shifting *y* to the left by two digits." (Wikipedia, section 2.5.)

Wikipedia also describes a variant of shifting which it calls a "logical shift" and states:

> In a *logical shift*, the bits that are shifted out are discarded, and zeros are shifted in (on either end). Therefore, the logical and arithmetic left-shifts are exactly the same operation. However, the logical right-shift inserts bits with value 0 instead of copies of the sign bit. Hence the logical shift is suitable for unsigned binary numbers, while the arithmetic shift is suitable for signed two's complement binary numbers.
> (Wikipedia, section 2.2, emphasis in original.)

Applicants note for the sake of completeness that two other variants are described as "rotate no carry" and "rotate through carry" (Wikipedia, sections 2.3 and 2.4, respectively,) however Applicants will not go into detail because at no point does Eid discuss a carry bit, and thus those two methods are not germane to the present discussion.

Shifting as described by Wikipedia and would be understood by an ordinarily skilled artesian, particularly logical shifting which is most applicable due to the lack of description of positive or negatives signs, is thus described as moving all of the bits of a given byte in a certain direction. The one or more bits that exceed the bounds of the byte, for example the former most significant bit (MSB) in a left-shift or the former least significant bit (LSB) in a right-shift, are removed. The one or more bits that now do not contain values, such as the LSB in a left-shift or the MSB in a right-shift, are given a value of 0.

<u>Independent Claims 1, 40, and 51 are Allowable over Eid in view of Denk and Motorola</u>

Claim 1 recites, in a computer system, a method of converting video data for a video image to a lower-precision representation for lower-precision processing of the video data, the method comprising, in part:

> receiving chroma and luma information for a pixel in the video image in an n-bit representation, the n-bit representation comprising a 16-bit fixed-point block of data per channel for the pixel comprising a most significant byte comprising 8 bits and a least significant byte comprising 8 bits, where the most significant byte in the 16-bit unit of data is an integer component comprising values each with a specific position relative to the 16-bit unit of data, and where the least significant byte in the 16-bit unit of data is a fractional component;

> converting the n-bit representation to a lower-precision representation by assigning zero values to one or more least significant bits in the fractional component while the values and the specific positions of the values of the integer component are unchanged.

Independent claim 40 recites a computer system comprising, in part:

> means for receiving chroma and luma information for at least one pixel in a video image, the chroma and luma information in an n-bit representation, the n-bit representation comprising a 16-bit fixed-point block of data per channel for the pixel comprising a most significant byte comprising 8 bits and a least significant byte comprising 8 bits, where the most significant byte in the 16-bit unit of data is an integer component comprising values each with a specific position relative to the 16-bit unit of data, and where the least significant byte in the 16-bit unit of data is a fractional component
>
> means for converting the n-bit representation to a lower-precision representation by assigning zero values to one or more least significant bits in the fractional component while the values and the specific positions of the values of the integer component are unchanged.

Independent claim 51 recites one or more computer-readable media having computer-executable instructions stored thereon for causing a computer to perform a method comprising, in part:

> receiving chroma and luma information for a pixel in the video image in an n-bit representation, the n-bit representation comprising a 16-bit fixed-point block of data per channel for the pixel comprising a most significant byte comprising 8 bits and a least significant byte comprising 8 bits, where the most significant byte in the 16-bit unit of data is an integer component comprising values each with a specific position relative to the 16-bit unit of data, and where the least significant byte in the 16-bit unit of data is a fractional component
>
> converting the n-bit representation to a lower-precision representation by assigning zero values to one or more least significant bits in the fractional component while the values and the specific positions of the values of the integer component are unchanged.

Eid does not teach or suggest the above cited language of independent claims 1, 40, and 51, nor do Denk or Motorola cure the deficiencies of Eid. The Examiner states that Eid discloses:

> converting (shifted) the n-bit representation (16 bit integer) to a lower-precision representation (10 bit value) by assigning zero values to one or more least significant bits in the fractional component [(0023); **shifting corresponds to assigning zero values**], and outputting a result of the converting (fig. 2).
> (Action, page 6, emphasis added.)

Applicants respectfully disagree. Eid states: "The 16-bit integer then is shifted by 6 bits to obtain a 10-bit value." (Eid, para. 0023.) Eid gives specific equations for the shifting by stating:

*Y*10.6=(16 <<8)+(219<<8)**Y*2.14/16384.0
Y10=Y10.6>>6
*C*10.6=(128<<8)+(224<<8)**C*2.14*16384.0
C10=C10.6>>6
(*Id.*)

Eid thus describes a 10-bit representation (Y10 or C10) which is achieved by shifting the 16-bit representation (Y10.6 or C10.6) to the right by six places. As described above, the result of this shifting operation would be that the last six digits of the 16 bit number would be lost and **the first six digits of the 16 bit number would be 0**. By way of example only and using the variables *a* and *b* for the sake of clarity, Applicants suggest that if Y10.6 = aaaaaaaaaabbbbbb then the result of performing the shifting operation Y10=Y10.6>>6 would be Y10=000000aaaaaaaaaa. Applicants thus respectfully disagree that Eid describes "assigning zero values to one or more least significant bits in the fractional component while the values **and the specific positions of the values** of the integer component are unchanged" as recited in independent claims 1, 40, and 51 because the shifting operation of Eid shifts **all** of the values of the 16-bit number to the right and then inserts values of 0 to the MSBs, rather than the LSBs.

The Examiner recognizes this deficiency in Eid and states that "Eid does not explicitly teach that the integer component represented by the most significant byte is unchanged." (Action, pages 6-7.) The Examiner continues:

> [I]t would have been obvious to one of ordinary skill in the art at the time of present invention to have the integer component comprising n digits remain unchanged as taught by Denk and use it into the method of Eid because the most significant n digits of the higher precision representation n+a constitute the precision portion of the rounding operand, with the remaining a digits being the loss portion ([0057]).
> (Action, page 7.)

Applicants respectfully disagree. "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)." (MPEP § 2143.01(VI).) In the present case, Eid relies on shifting to obtain a 10-bit value from a 16-bit value. As discussed above, one skilled in the art would understand

that a result of right-shifting (as described in Eid) is that values of 0 are inserted to the MSBs of the 16-bit number. Claims 1, 40, and 51 specify that "the most significant byte in the 16-bit unit of data is an integer component." Even if, for the sake of argument, Denk describes having the integer component comprising n digits remain unchanged, combining the alleged teaching of Denk with the method of Eid such that "values **and the specific positions of the values** of the integer component are unchanged" would no longer be shifting as recited in Eid. Thus the combination of Denk and Eid does not render the claims *prima facie* obvious because the principle of operation of Eid would not be the same.

The Examiner then states that:

> The combination of Eid and Denk discloses shifting and rounding operations, but they do not explicitly teach to assign zero values to one or more least significant bits in the fractional component while the integer component is unchanged. . . . [I]t would have been obvious to one of ordinary skill in the art at the time of present invention to assign zero values to the least significant byte of the higher precision representation as taught by Motorola and used it in the method of Eid and Denk because the lower precision representation is still represented as 16 bits which could be very useful as most of the systems have 8 bits or multiple of 8 bits processors.
> (Action, pages 7 and 8.)

Applicants agree that the combination of Eid and Denk does not explicitly teach to assign zero values to one or more least significant bits in the fractional component while the integer component is unchanged, but respectfully disagree with the Examiner's allegation that Motorola cures the deficiencies of Eid and Denk.

As a preliminary matter, Applicants note that Motorola does not teach or suggest "assign[ing] zero values to one or more least significant bits in the fractional component" as alleged by the Examiner. Motorola specifically states that "[t]he destination is cleared to all zero. **The size of the operation may be specified to be byte, word, or long**." (Motorola, "Description".) Thus, the smallest unit on which Motorola is operable is a byte. Motorola, then is clearly not operable to clear "**one or more least significant bits** in the fractional component" as alleged by the Examiner, particularly when the fractional component is an 8-bit least significant byte of a 16-bit unit of data as recited by independent claims 1, 40, and 51.

Applicants additionally note that even if Motorola were operable to change single bits within a byte, the alleged combination of references would still be improper. "If proposed modification would

render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." (MPEP § 2143.01(V).) As described above, Eid describes converting a 16-bit number to a 10-bit number by right-shifting the 16-bit number by six places. As described above with respect to Wikipedia, the result of this is to shift all of the values of the 16-bit number to the right by six places, and assign zero values to the first six MSBs. By additionally assigning zero values to the LSBs as allegedly described in Motorola, data precision would be lost because data containing digits of the LSBs would be replaced with values of 0, and thus the number would no longer be a 10-bit value as described by Eid. The proposed combination of references would render Eid unsatisfactory for its intended purpose, namely representing a 10-bit value, and thus the Examiner's proposed combination is an improper combination of references.

Eid, Denk, and Motorola, whether considered separately or in combination with each other, do not teach each and every element of independent claims 1, 40, and 51. Independent claims 1, 40, and 51 are therefore allowable for at least the reasons stated above. Applicants respectfully request withdrawal of the § 103(a) rejection and allowance of independent claims 1, 40, and 51.

<u>Dependent Claims 2, 3, 5, 35, 39, 41, 45-50, 52, and 53 are Allowable over Eid in view of Denks and Motorola</u>

Dependent claims 2, 3, 5, 35, 39, 41, 45-50, 52, and 53, which depend either directly or indirectly from independent claims 1, 40, and 51, are allowable at least for the reasons above as well as the unique and non-obvious features of each of the dependent claims. Applicants respectfully request withdrawal of the § 103(a) rejections and allowance of dependent claims 2, 3, 5, 35, 39, 41, 45-50, 52, and 53.

<u>Dependent Claim 4 is Allowable over Eid in view of Denks and Motorola and further in view of Lundberg</u>

The Examiner rejects dependent claim 4, which depends from claim 1, over Eid in view of Denks, Motorola, and Lundberg. Applicants respectfully disagree.

In response to the Applicant's arguments in the Office Action Response filed on September 5, 2007, the Examiner states that:

> Regarding claims 4 and 36-38 the Applicant argues that Lundberg (claim 4), FOURCC.org YUV pixel formats document (claims 38 and 44), and Reitmeier (claims 36, 37, 42, and 43) do not respectively teach or suggest 'the n-bit representation is convertible to a lower-precision representation by assigning zero values to one or more significant bits in the fractional component while the integer component is unchanged' (see last four lines of pg. 8, pg. 9 paragraph 3 lines 5-8, pg. 10 lines 3-5 of applicant's remarks).
>
> In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. . . . The above limitation is taught by the combination of Eid, Denk and Motorola in the independent claims 1 and 40. (Action, pages 4 and 5.)

Applicants respectfully remind the Examiner that "[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). 'All words in a claim must be considered in judging the patentability of that claim against the prior art.' *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). **If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious.**" (MPEP § 2143.03.)

As described above, each and every element of claim 1, from which claim 4 depends, are not taught or suggested by the combination of Eid, Denk, and Motorola. Specifically, Eid does not teach or suggest "assigning zero values to one or more least significant bits in the fractional component while the values and the specific positions of the values of the integer component are unchanged" as recited in claim 1. Neither Denk nor Motorola, whether considered separately or in combination with each other, cure this deficiency in Eid.

Similarly, Lundberg does not cure this deficiency in Eid. At no point does Lundberg teach or even suggest the above recited language of claim 1, from which claim 4 depends. Thus, claim 4, which depends from claim 1, is allowable over the Eid in view of Denk, Motorola, and Lundberg. Applicants respectfully request withdrawal of the § 103(a) rejection and allowance of dependent claim 4.

Dependent Claims 38 and 44 are Allowable over Eid in view of Denk, Motorola, and FOURCC.org

Dependent claims 38 and 44, which depend from independent claims 1 and 40 respectively are rejected over Eid in view of Denk and Motorola, and further in view of FOURCC.org.

As described above, each and every element of claims 1 and 40, from which claims 38 and 44 respectively depend, are not taught or suggested by the combination of Eid, Denk, and Motorola. Specifically, Eid does not teach or suggest "assigning zero values to one or more least significant bits in the fractional component while the values and the specific positions of the values of the integer component are unchanged" as recited in independent claims 1 and 40. Neither Denk nor Motorola, whether considered separately or in combination with each other, cure this deficiency in Eid.

Similarly, FOURCC.org does not cure this deficiency in Eid. At no point does FOURCC.org teach or even suggest the above recited language of independent claims 1 and 40, from which claims 38 and 44 respectively depend. Thus, claims 38 and 44, which respectively depend from claims 1 and 40, are allowable over the Eid in view of Denk, Motorola, and FOURCC.org. Applicants respectfully request withdrawal of the § 103(a) rejections and allowance of dependent claims 38 and 44.

Dependent Claims 36 and 37 are allowable over Eid in view of Denk, Motorola, and Reitmeier.

Dependent claims 36 and 37, which depend from independent claim 1 are rejected over Eid in view of Denk and Motorola, and further in view of Reitmeier.

As described above, each and every element of claim 1, from which claims 36 and 37 depend, are not taught or suggested by the combination of Eid, Denk, and Motorola. Specifically, Eid does not teach or suggest "assigning zero values to one or more least significant bits in the fractional component while the values and the specific positions of the values of the integer component are unchanged" as recited in independent claim 1. Neither Denk nor Motorola, whether considered separately or in combination with each other, cure this deficiency in Eid.

Similarly, Reitmeier does not cure this deficiency in Eid. At no point does Reitmeier teach or even suggest the above recited language of independent claim 1, from which claims 36 and 37 depend. Thus, claims 36 and 37, which depend from claim 1, are allowable over the Eid in view of Denk, Motorola, and Reitmeier. Applicants respectfully request withdrawal of the § 103(a) rejections and allowance of dependent claims 36 and 37.

Interview Request

If the claims are not found by the Examiner to be allowable, the Examiner is requested to call the undersigned attorney to set up an interview to discuss this application.

Conclusion

The claims in their present form should be allowable. Such action is respectfully requested.

Respectfully submitted,

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